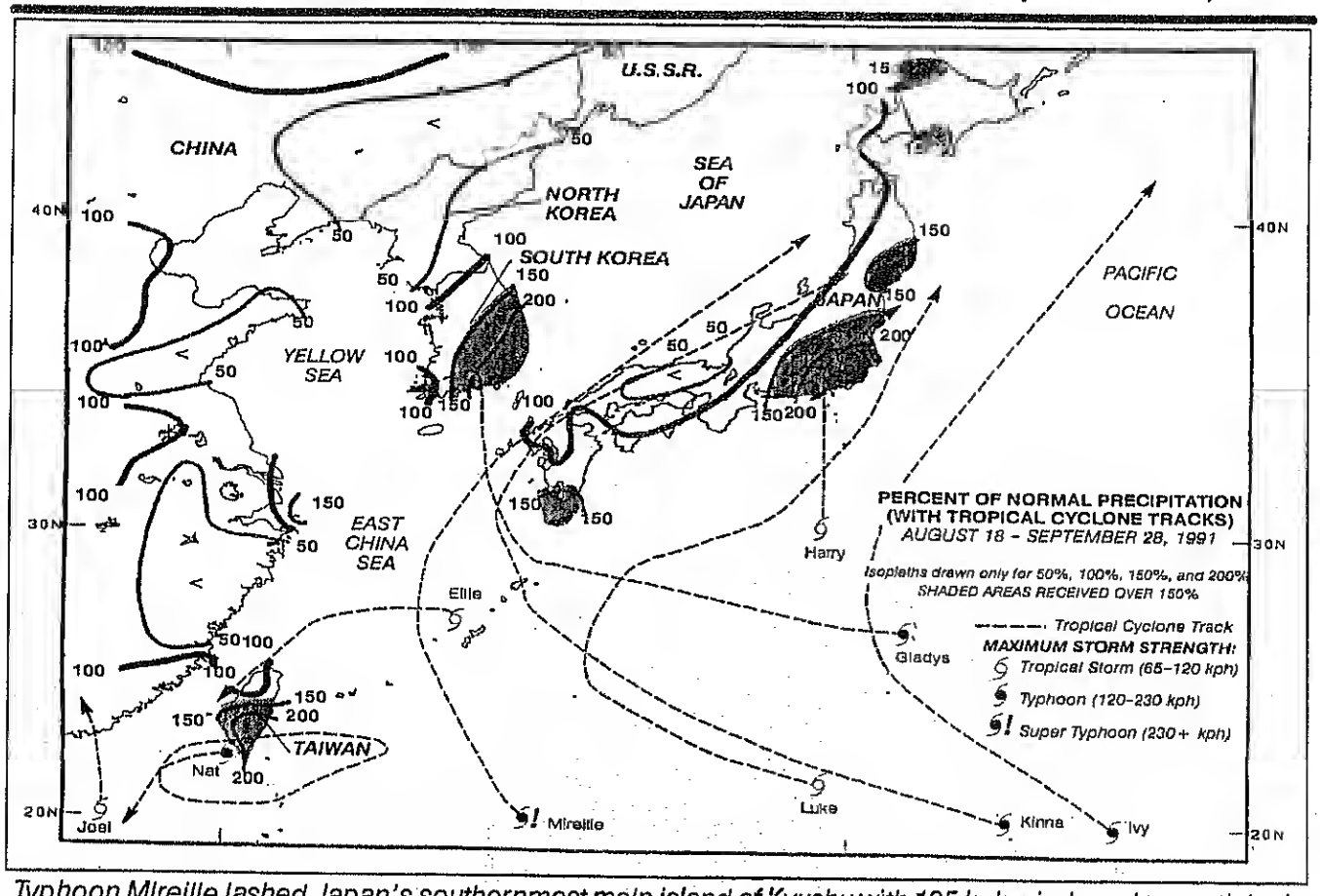
CLIMATE ANALYSIS CENTER

CONTAINS:
REVIEW OF 1991 AFRICAN SAHEL RAINY SEASON

WEEKLY CLIMATE BULLETIN

No. 91/39 **Washington, DC** **September 28, 1991**



Typhoon Mireille lashed Japan's southernmost main island of Kyushu with 195 kph winds and torrential rain of up to 200 mm, taking over 50 lives and causing more destruction than any storm since 1971, according to press reports. Mireille was the sixth tropical cyclone to affect Japan since August 18 as abnormally heavy rainfall, primarily due to these storms, covered all but western portions of the nation during August 18 - September 28. The Tokyo vicinity has been pounded with over 600 mm of rain, more than twice the normal for this period, causing numerous landslides and a number of deaths. Minimal Typhoon Gladys (see Weekly Climate Bulletin, No. 91/34, dated August 24, 1991) brought over 700 mm to southeastern South Korea while the latest storm, Typhoon Nat, drenched southern Taiwan last week.

UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE-NATIONAL METEOROLOGICAL CENTER
CLIMATE ANALYSIS CENTER

WEEKLY CLIMATE BULLETIN

This Bulletin is issued weekly by the Climate Analysis Center and is designed to indicate, in a brief concise format, current surface climatic conditions in the United States and around the world. The Bulletin contains:

- *Highlights of major climatic events and anomalies.*
- *U.S. climatic conditions for the previous week.*
- *U.S. apparent temperatures (summer) or wind chill (winter).*
- *Global two-week temperature anomalies.*
- *Global four-week precipitation anomalies.*
- *Global monthly temperature and precipitation anomalies.*
- *Global three-month precipitation anomalies (once a month).*
- *Global twelve-month precipitation anomalies (every three months).*
- *Global three-month temperature anomalies for winter and summer seasons.*
- *Special climate summaries, explanations, etc. (as appropriate).*

Most analyses contained in this Bulletin are based on preliminary, unchecked data received at the Climate Analysis Center via the Global Telecommunications System. Similar analyses based on final, checked data are likely to differ to some extent from those presented here.

STAFF

Editor	Tom Heddinghaus
Associate Editor	Richard Tinker
Contributors	Joe Harrison
	Paul Sabol
	David C. Stutzer
Graphics	Robert H. Churchill
	Alan Herman

*To receive copies of the **Bulletin** or to change mailing address, write to:*

Climate Analysis Center, W/NMC53

Attn: WEEKLY CLIMATE BULLETIN

NOAA, National Weather Service

Washington, DC 20233

For CHANGE OF ADDRESS, please include a copy of your old mailing label.

Phone: (301) 763-8071

WEEKLY CLIMATE BULLETIN REQUESTS

☐ **Please ADD my address to your mailing list.**

☐ **Please CHANGE my address on your mailing list.**

☐ **Please DROP my address from your mailing list.**

Name _____

Organization _____

Address _____

City _____ State _____ Zip _____

GLOBAL CLIMATE HIGHLIGHTS

MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF SEPTEMBER 28, 1991

1. Alaska:

DRYNESS PERSISTS.

Dry weather continued over northeastern sections of the state, where less than half of normal precipitation has fallen since mid-August [10 weeks].

2. Central United States:

COLD AIR SETTLES ACROSS REGION.

Cold Canadian air remained across the central states as temperatures again averaged 3°C to 7°C below normal in the Great Plains and Mississippi Valley. Lows dropped to -5°C in parts of the Great Lakes and Upper Midwest [2 weeks].

3. South-Central United States:

DRIER WEATHER PREVAILS.

Little or no rainfall across Oklahoma and northeastern Texas brought relief from the wet weather which had plagued the area Ending after 12 weeks].

4. The Azores:

A SECOND DRY WEEK ENDS WETNESS.

Little or no rain again fell across the islands, bringing an end to the moisture surpluses which had prevailed [Ended after 4 weeks].

5. Central and Northwestern Europe:

WIDESPREAD RAINS RELIEVE EXTREME DRYNESS.

Moderate to heavy rains of 30-100 mm during the latter part of the week eased dryness over most of northeastern and central Europe. Torrential rains of 100 - 200 mm soaked much of Switzerland , where six-week moisture shortages had exceeded 200 mm [Ending after 8 weeks]. Weekly departures of +3°C to +6°C were reported across Germany, Austria, Czechoslovakia, and Hungary as abnormally warm conditions continued [9 weeks].

6. Southeast Asia:

MORE HEAVY RAINS.

Although no rainfall reports are received from Cambodia, southeastern Thailand and southern Vietnam again reported heavy rains of 100 - 300 mm. According to press reports, heavy rains in southern Vietnam since early this month caused the Mekong River to overflow its banks, taking at least 55 lives and destroying some 100,000 houses, over 800 square kilometers of rice paddies, and 350 km of roads [8 weeks].

7. South-Central China:

HEAVY RAINS TRIGGER LANDSLIDES.

Several days of torrential downpours caused landslides that killed more than 200 people in the province of Yunnan, according to press reports [Episodic Event].

8. Taiwan:

TYPHOON DOUSES ISLAND WITH HEAVY RAIN.

Typhoon Nat, drenching eastern Taiwan with daily amounts of up to 268 mm, moved westward across southern parts of the island. The storm has brought heavy rains to the island for two consecutive weeks, dumping up to 600 mm on several locations in the eastern half of the island (2 weeks).

9. Northeastern China and Northern North Korea:

WIDESPREAD DRYNESS.

Light rains of only 10 - 20 mm fell across much of northeastern China as long-term dryness continued. Little or no rain fell over most of North Korea where shortfalls of 100 - 200 mm have been measured since mid-August [8 weeks].

10. Japan:

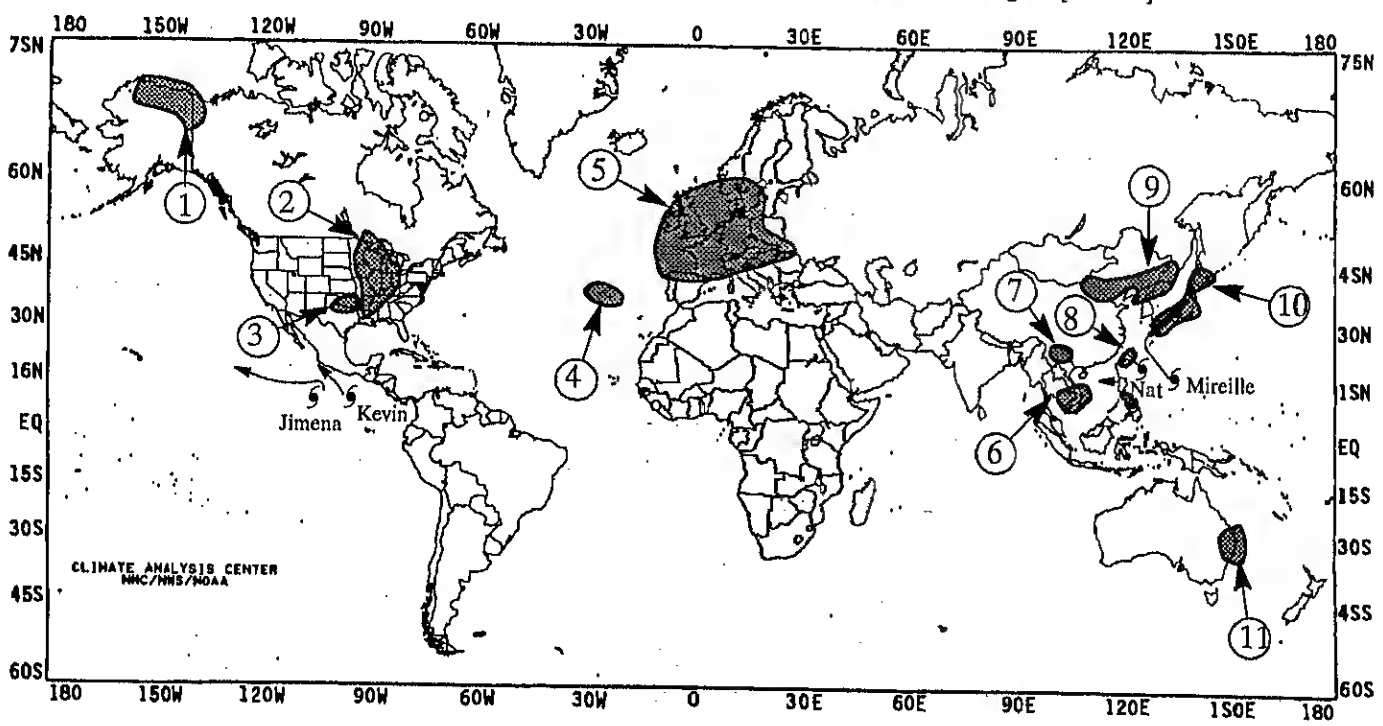
ANOTHER TYPHOON STRIKES REGION.

Typhoon Mireille, packing 195 kph winds and torrential rain, smashed into western Japan and traveled northeastward close to the western coast as it disintegrated. The storm dumped 100 - 200 mm of rain across most of Hokkaido, Kyushu, and southern Honshu. Mireille was the latest in a series of tropical storms to batter Japan and, according to press reports, took over 50 lives, making it Japan's deadliest storm since 1971 (see front cover) [3 weeks].

11. East-Central Australia:

DRY WEATHER CONTINUES.

Dry weather again prevailed in most areas as exceptionally dry conditions persisted. Only 10 - 20 mm dampened extreme southern sections of the afflicted region [9 weeks].



EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.
MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two week temperature anomalies, four week precipitation anomalies, long-term anomalies, and other details.

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF SEPTEMBER 22 – 28, 1991

The last full week of September produced a sharp contrast of seasons. While unseasonably cold weather dominated the nation east of the Rockies, summer-like conditions settled to the west. Numerous record daily lows were established from the southern Plains to the Northeast. Some locations in the Great Lakes and Ohio Valley observed all-time record lows for the month of September. The low of 27°F on the 28th at Grand Rapids, MI was both a record for the date and the lowest reading ever recorded in the month. Sub-freezing temperatures were common across the upper Midwest and Great Lakes and reached as far south as the central Appalachians (Figure 1). Meanwhile, abnormally warm weather enveloped the Far West. Readings topped the century mark from southern California to southern Oregon. Elsewhere, strong thunderstorms drenched parts of Texas with up to half a foot of rain, causing flooding along the Frio River near Concan, TX. Some of the worst flooding since 1978 occurred along the Rio Grande River after several levees gave way, leaving farmland and several roads near Presidio, TX under water. Thunderstorms dumped over 4 inches of rain across the eastern half of New England. Portland, ME has measured over 4.5 inches of rain this month, pushing the August-September 1991 total to over over 19 inches of rain, making it the wettest two month period on record. Elsewhere, wind gusts estimated at over 70 mph accompanied a storm that moved through Boston, MA. Farther west, Bakersfield, CA recorded the first rain since mid-April when showers produced a tenth of an inch on Wednesday.

As the week began, autumn weather prevailed in the Ohio Valley, New England, and mid-Atlantic. Record lows were observed in half a dozen states in the Northwest and East. Meanwhile, a cold front in the nation's midsection trekked eastward. Severe weather broke out along and ahead of the front as it pushed through Texas. Up to 6 inches of rain fell in 3 hours across parts of southern Texas, causing flash floods. One storm spawned a tornado near Arroyo, TX. Farther west, hot weather overspread most of California and the Pacific Northwest. Record daily highs were reported in California on Monday as readings topped 100°F in the interior sections and by Tuesday record warmth had pushed northward into Oregon. In Hawaii, heavy rains soaked Hilo, causing minor flooding.

During the last half of the week the cold front in the central U.S. had pushed into the East, spreading heavy rain up the East Coast. Strong thunderstorms battered eastern New England, generating over 4 inches of rain and strong wind gusts. The front eventually pushed off the East Coast and unseasonably cold air filtered back across the Great Lakes, Northeast and mid-Atlantic. Numerous record daily lows were recorded from the upper Midwest to the Northeast as readings dipped below freezing. Elsewhere, unseasonably warm conditions persisted in the Far West. Record daily highs were established from Washington to Nevada and readings topping the century mark were observed as far north as Medford, OR. To the south, rare thunderstorms moved through portions of northern California, causing power outages in Salinas, CA. By the weekend, high pressure dominated most of the country, producing relatively dry and tranquil weather from the Far West to the Atlantic Coast.

According to the River Forecast Centers, the greatest weekly totals (more than 2 inches) occurred from south-central Texas northeastward into the Tennessee Valley, across southern and central Florida, the coastal Plains of North Carolina and Virginia, the eastern half of New England, scattered locations in the Ohio Valley, most of southern Alaska, and eastern Hawaii (Table 1). Light to moderate amounts were measured in the southern Plains, the Mississippi Valley eastward to the Atlantic Coast, and across much of central and western Alaska. Little or no precipitation fell from the northern half of the Great Plains to the Far West, across eastern Alaska, and the remainder of the Hawaiian Islands.

Abnormally warm weather dominated west of the Rockies (Table 2). Weekly departures between +7°F and +11°F were common from southern Arizona to central Washington while departures of +2°F to +6°F were prevalent aeross the remainder of the West. Near to slightly above normal temperatures covered the southern half of Florida and the Hawaiian Islands. In Alaska, unusually mild conditions covered most of the state again this week. Weekly departures up to +6°F were observed at numerous locations in east-central and southwestern portions of the state where highs approached 60°F. Temperatures averaged 2°F to 4°F above normal across the remainder of the state with the exception of extreme northern Alaska where near normal conditions were reported.

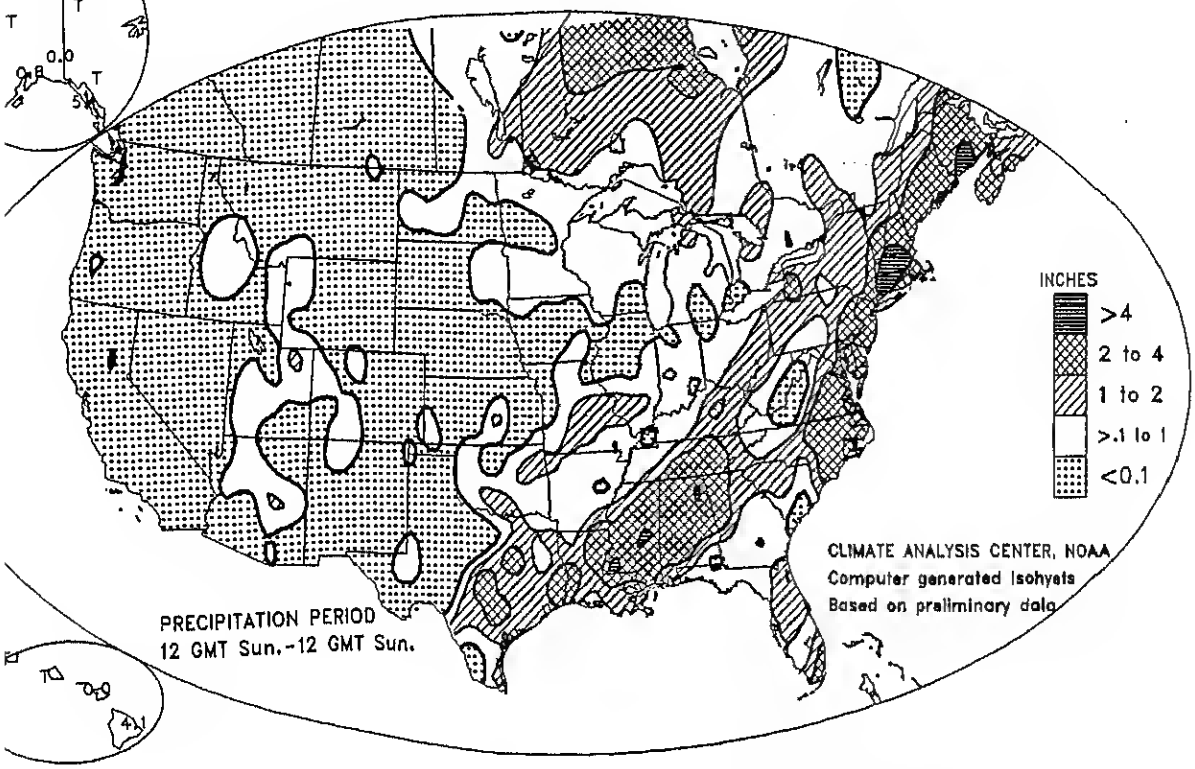
In sharp contrast, unseasonably cold conditions gripped much of the contiguous U.S. east of the Rockies (Table 3). Weekly departures between -8°F and -13°F stretched from the southern Plains to the northern Great Lakes while departures of -2°F to -7°F were recorded across the remainder of the eastern two-thirds of the nation.

TABLE 1. ***SELECTED STATIONS WITH 2.75 OR MORE INCHES OF PRECIPITATION DURING THE WEEK OF SEPTEMBER 22 – 28, 1991***

STATION	TOTAL (INCHES)	STATION	TOTAL (INCHES)
YAKUTAT, AK	5.85	HARTFORD, CT	3.08
SITKA, AK	5.14	MERIDIAN, MS	3.03
KODIAK, AK	4.58	POUGHKEEPSIE, NY	2.99
COROOVA/MILE 13, AK	4.49	PALACIOS, TX	2.98
HILO/LYMAN, HAWAII, HI	4.06	WORCESTER, MA	2.98
JUNEAU, AK	3.96	CHICOPEE/WESTOVER AFB, MA	2.94
CAPE HATTERAS, NC	3.89	CHATHAM, MA	2.92
BIRMINGHAM, AL	3.83	VALOEZ, AK	2.91
BOSTON, MA	3.81	WILLOW GROVE NAS, PA	2.88
EASTPORT, ME	3.73	MCCOMB, MS	2.86
MONROE, LA	3.58	SOUTH WEYMOUTH NAS, MA	2.85
PORTSMOUTH/PEASE AFB, NH	3.43	FALMOUTH/OTIS AFB, MA	2.82
PORT ARTHUR, TX	3.39	WILMINGTON, DE	2.82
BANGOR, ME	3.34		

OBSERVED PRECIPITATION

September 22 – 28, 1991



DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)

September 22 – 28, 1991

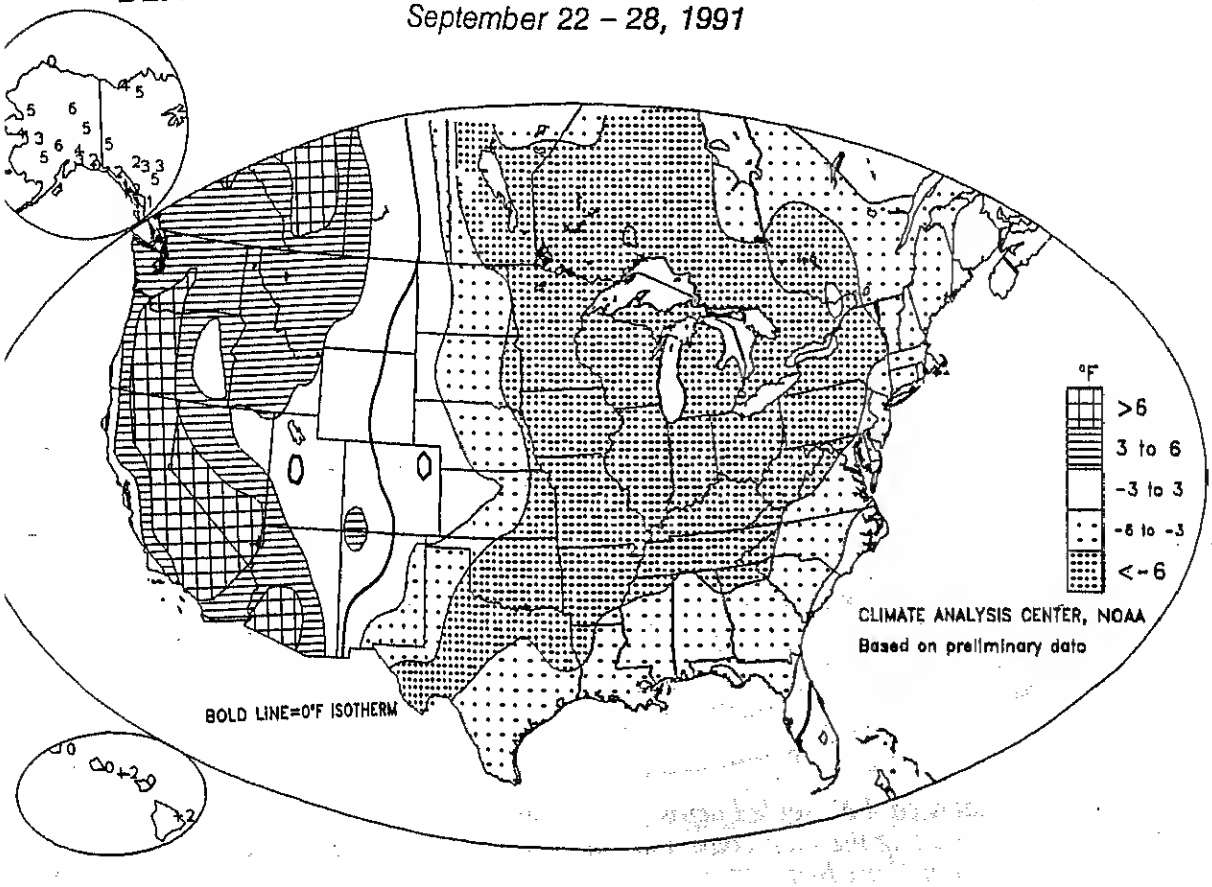


TABLE 2. *SELECTED STATIONS WITH TEMPERATURES AVERAGING 6.5°F OR MORE ABOVE NORMAL FOR THE WEEK OF SEPTEMBER 22 – 28, 1991*

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
SEXTON SUMMIT, OR	+12.4	69.9	BAKERSFIELD, CA	+7.2	82.2
SAN BERNARDIND/NORTON, CA	+10.9	81.8	PORTLAND, OR	+7.2	67.5
BURBANK, CA	+10.1	80.9	WENATCHEE, WA	+7.2	67.3
VICTORVILLE/GEORGE AFB, CA	+10.0	79.1	RENO, NV	+7.2	64.6
STAMPEDE PASS, WA	+8.9	57.8	MT SHASTA, CA	+7.0	65.5
MEDFORD, OR	+8.6	70.9	OAGGETT, CA	+6.8	83.8
PHOENIX, AZ	+8.4	90.2	GLENDALE/LUKE AFB, AZ	+6.7	86.9
FRESNO, CA	+8.3	80.1	YUMA, AZ	+6.6	91.2
BLUE CANYON, CA	+8.2	68.9	TONOPAH, NV	+6.6	67.2
RED BLUFF, CA	+7.5	80.2	LAS VEGAS, NV	+6.5	83.2

TABLE 3. *SELECTED STATIONS WITH TEMPERATURES AVERAGING 9.0°F OR MORE BELOW NORMAL FOR THE WEEK OF SEPTEMBER 22 – 28, 1991*

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
LANSING, MI	-13.1	45.2	WATERLOO, IA	-9.5	49.1
JACKSON, MI	-12.8	46.9	JOPLIN, MO	-9.5	58.4
GRAND RAPIDS, MI	-12.2	47.0	FINDLAY, OH	-9.4	52.1
SAGINAW, MI	-11.7	46.6	PARKERSBURG, WV	-9.4	55.0
FLINT, MI	-11.6	46.7	LA CROSSE, WI	-9.3	49.2
MT CLEMENS/SELFRIDGE, MI	-11.3	48.8	POPLAR BLUFF, MO	-9.3	69.4
FT WAYNE, IN	-11.2	50.3	ALPENA, MI	-9.2	45.0
SOUTH BEND, IN	-11.0	50.3	ROCHESTER, MN	-9.2	46.8
MUSKEGON, MI	-10.8	47.7	HOUGHTON LAKE, MI	-9.1	45.3
TOLEDO, OH	-10.3	49.9	CEDAR RAPIDS, IA	-9.1	51.9
WEST PLAINS, MO	-10.2	55.8	DECATUR, IL	-9.1	56.0
CHICAGO/O'HARE, IL	-10.1	51.2	GREEN BAY, WI	-9.0	46.7
CHICAGO/MIDWAY, IL	-10.0	53.0	ROCKFORD, IL	-9.0	51.1
WAUSAU, WI	-9.9	44.7	BLYTHEVILLE AFB, AR	-9.0	61.9
MASON CITY, IA	-9.5	47.9			

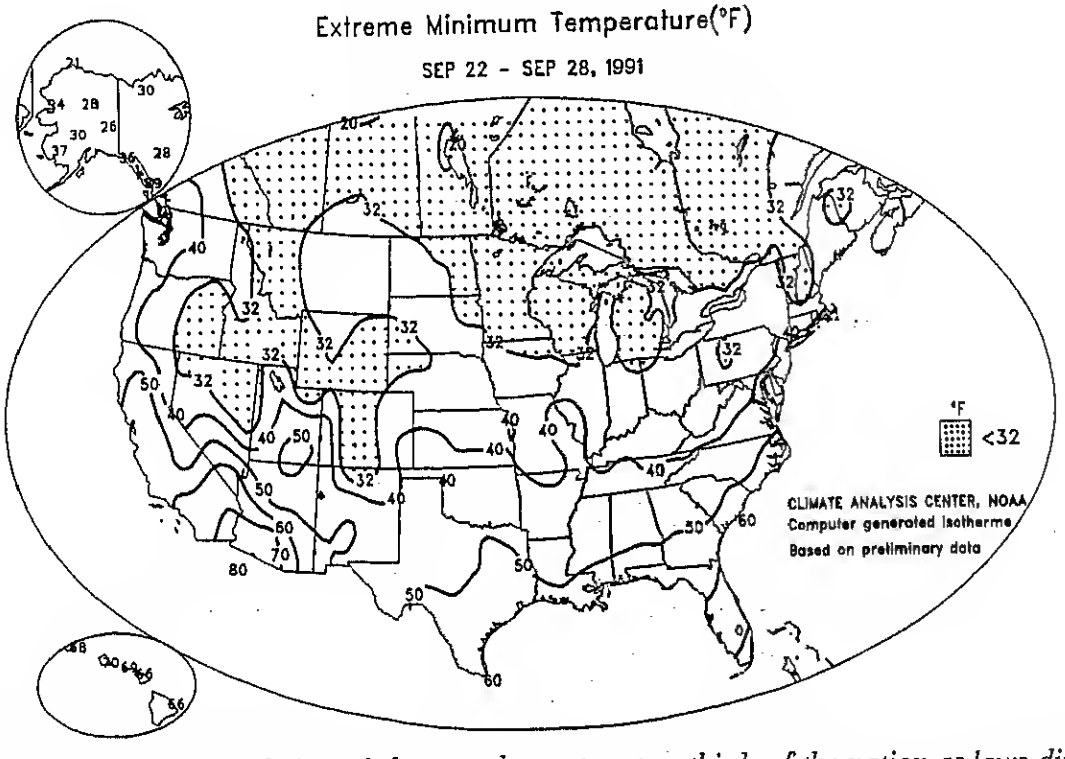
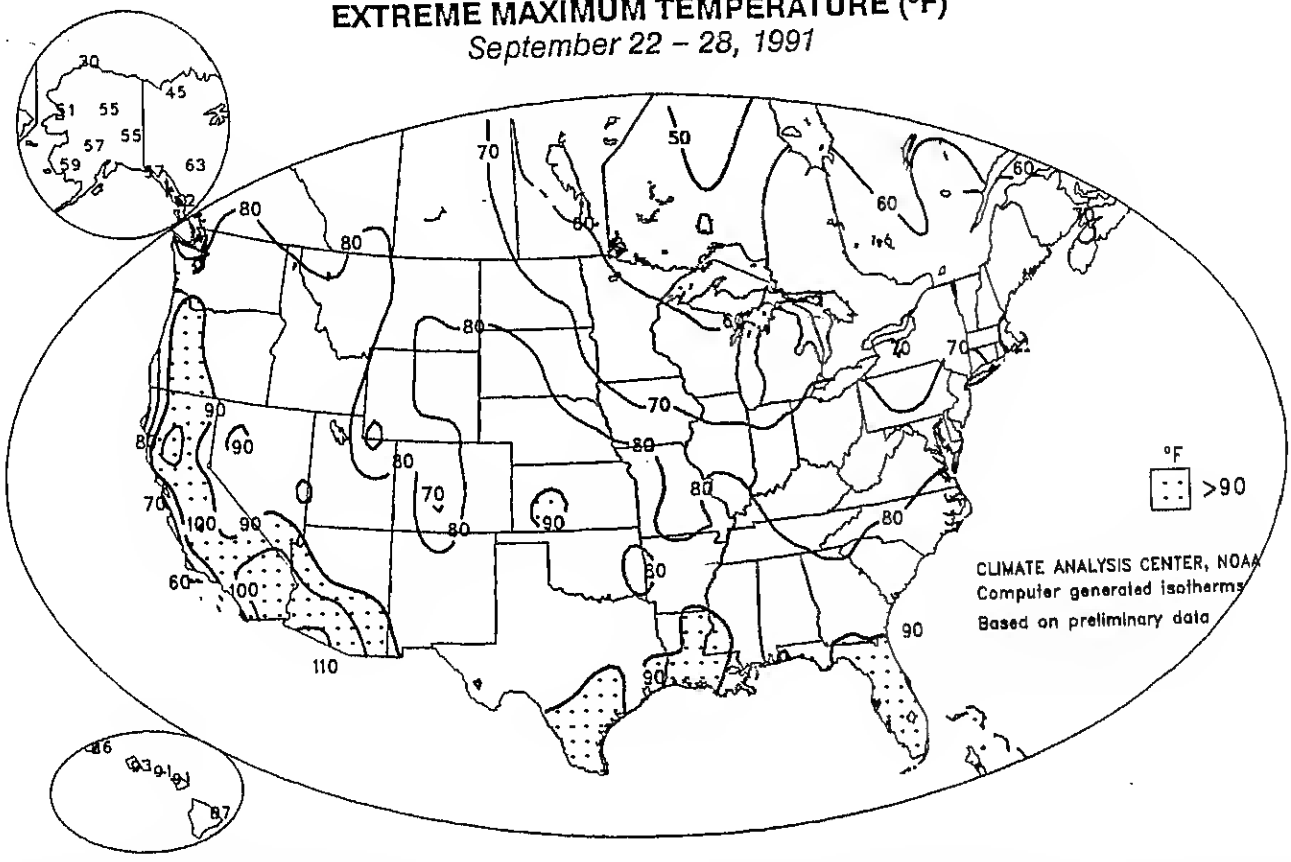


FIGURE 1. *Unseasonably cool air settled across the eastern two-thirds of the nation as lows dipped into the forties everywhere but along the Gulf coast and south Atlantic seaboard. Subfreezing readings reached as far south as the northern Corn Belt.*

EXTREME MAXIMUM TEMPERATURE (°F)

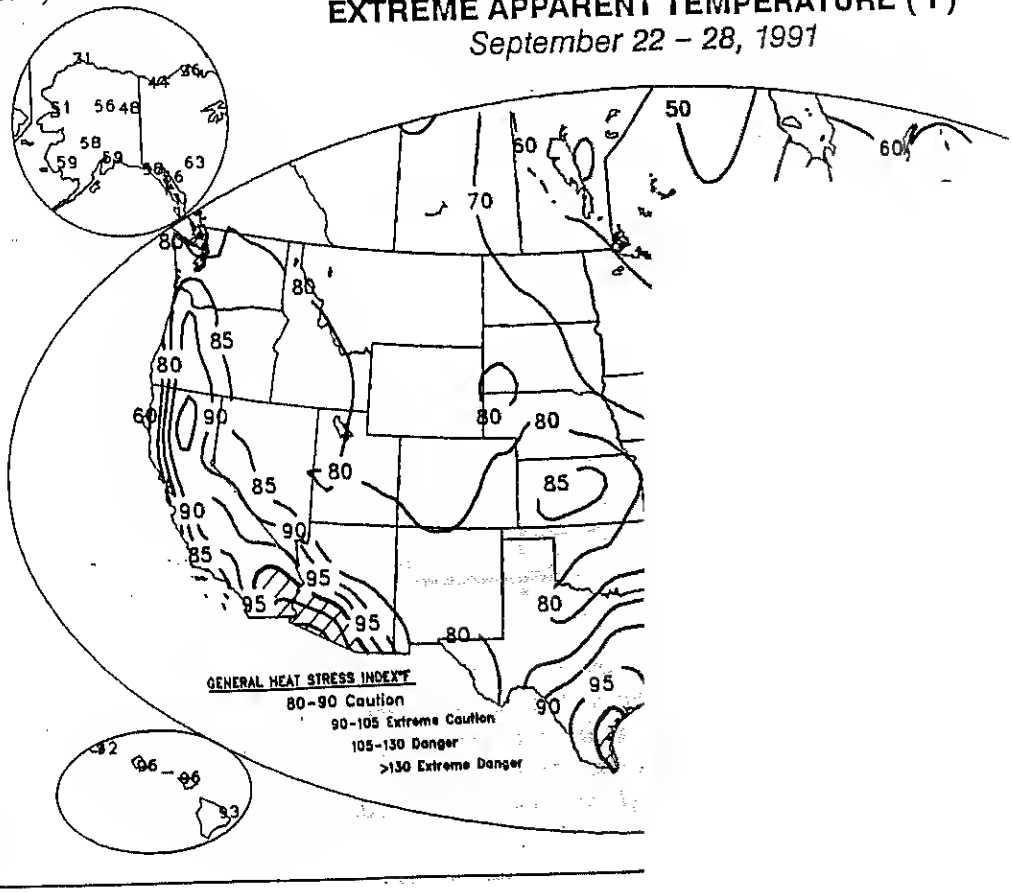
September 22 – 28, 1991



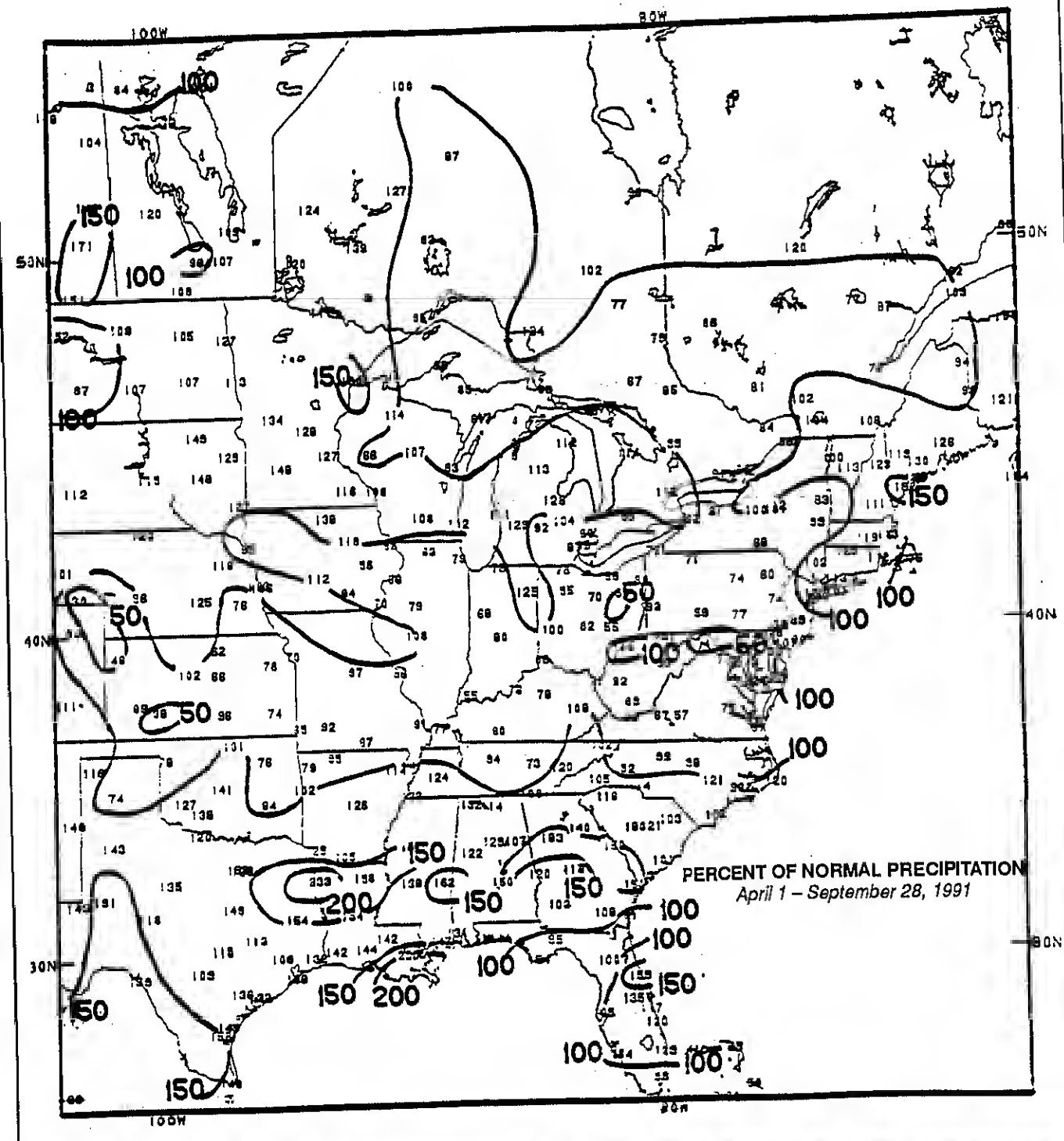
Abnormally warm weather affected only the Far West as highs exceeded the century mark in the desert Southwest and interior California (top). Uncomfortable apparent temperatures (>95°F) were restricted to southern Texas and the desert Southwest (bottom).

EXTREME APPARENT TEMPERATURE (°F)

September 22 – 28, 1991



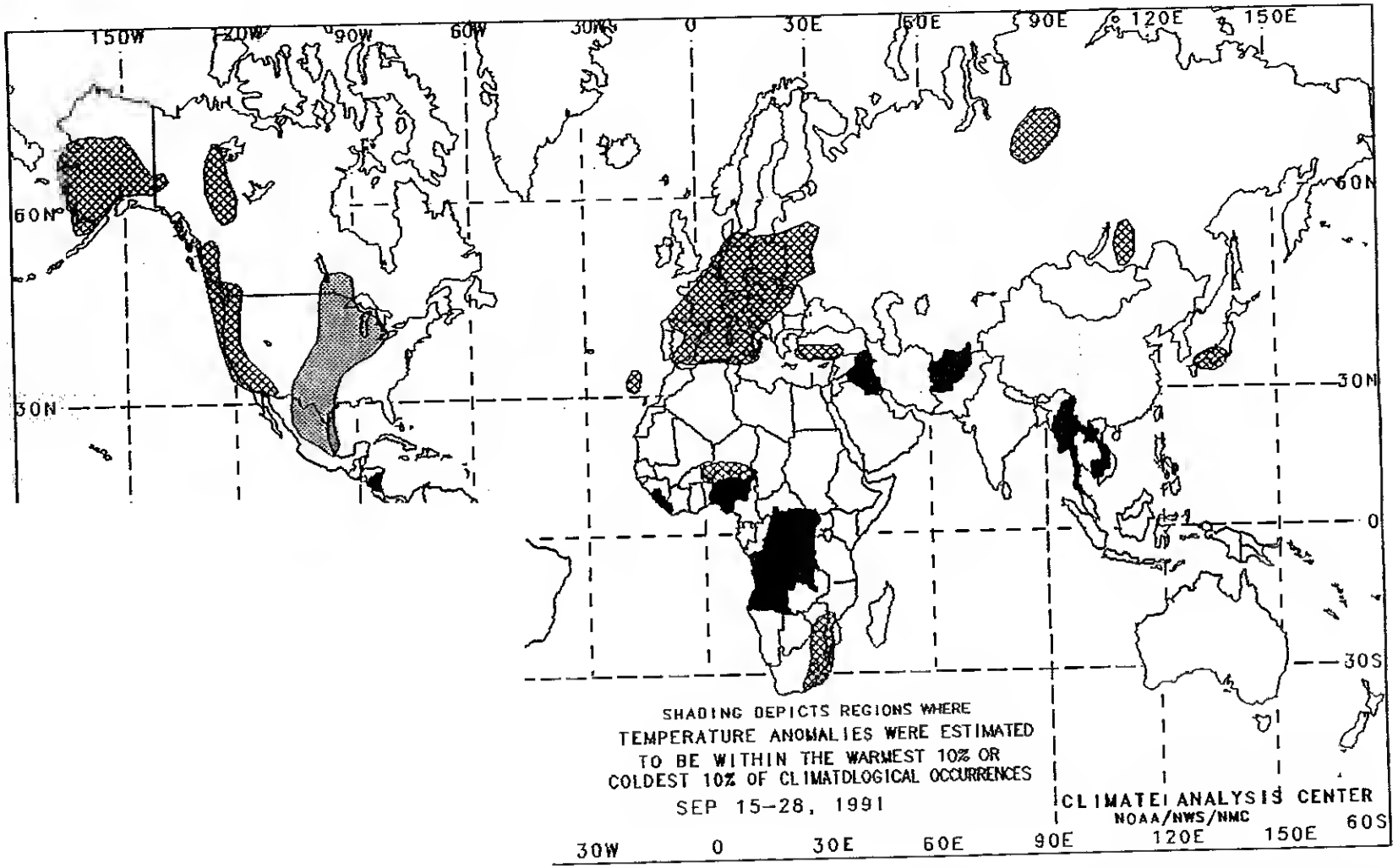
CLIMATE HIGHLIGHTS FEATURE



Although a number of storm systems brought widespread rain to the eastern half of the nation during September, total precipitation since April 1 remains well below normal across much of the region from the central Plains to the central Appalachians and mid-Atlantic coast. In contrast, heavy rain has fallen across the Deep South, where some locations received more than twice the normal precipitation. Farther north, abnormally high totals have also been measured across the northern Great Plains, upper Midwest, and New England, although Hurricane Bob accounted for much of the surplus in the latter region.

2–WEEK GLOBAL TEMPERATURE ANOMALIES

SEPTEMBER 15 – 28, 1991



…serving stations
…d from synoptic
…any night time
…e estimated
…esulted in an

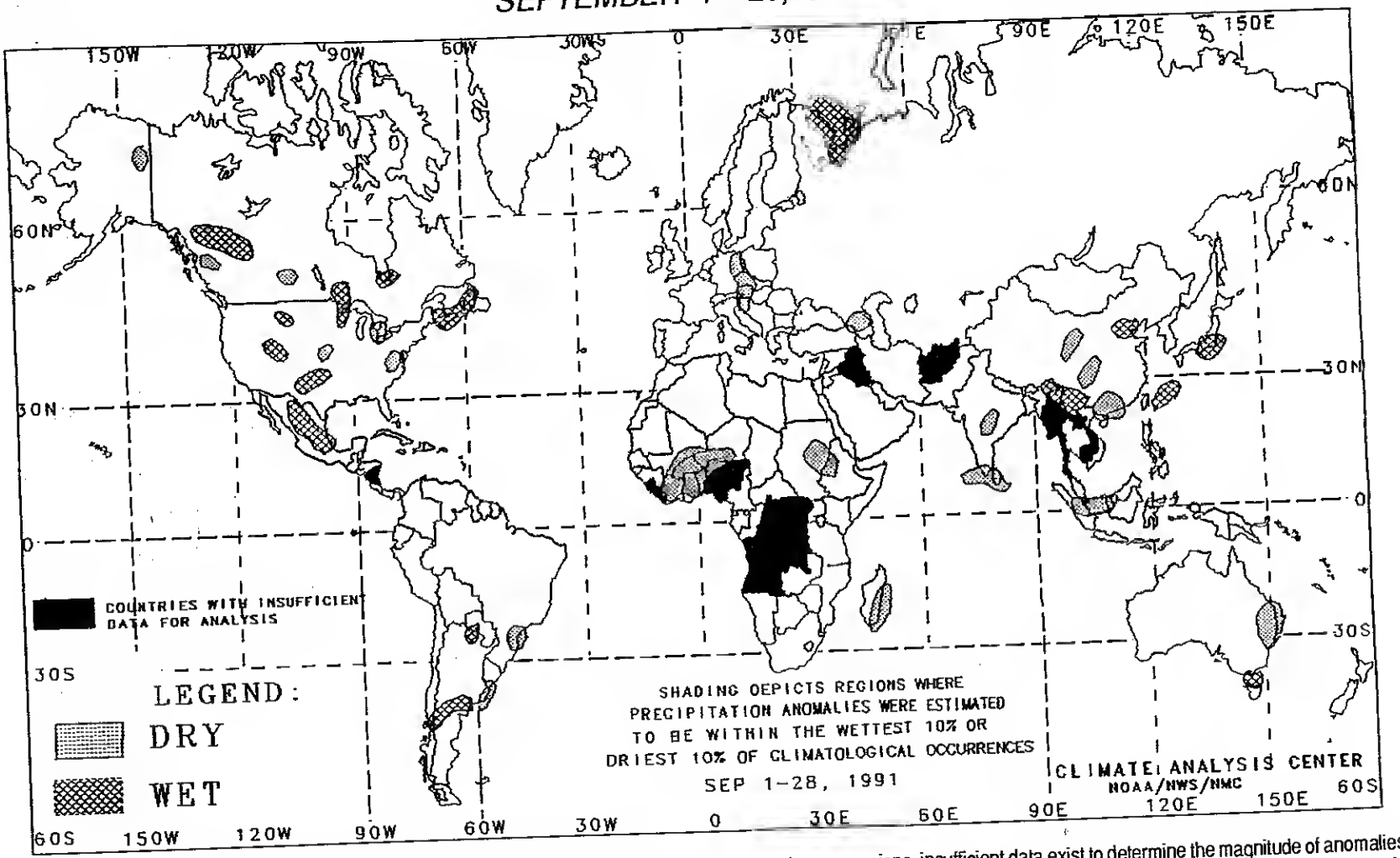
…perature

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of two week temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

4–WEEK GLOBAL PRECIPITATION ANOMALIES

SEPTEMBER 1 – 28,1991



The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the four week period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of four week precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

SPECIAL CLIMATE SUMMARY

CLIMATE ANALYSIS CENTER, NMC
NATIONAL WEATHER SERVICE, NOAA

REVIEW OF THE 1991 SAHEL RAINY SEASON

The previous update on the Sahelian rainy season (see Weekly Climate Bulletin #91/28, dated July 13, 1991, pp. 12 - 16 for more details) discussed the abnormally heavy and early onset of seasonal rains across southeastern and central Mali, Burkina Faso, most of central and southern Niger, Chad, and central and east-central Sudan during May. Most of these areas, however, went on to observe a drier than normal June and a slightly wet first half of July, restricting significant moisture surpluses to extreme southern Mali, much of Burkina Faso, and portions of southern Chad, where May and July were unusually wet. More significantly, little or no rain was measured during the first two months of the rainy season (May and June) in Senegal, southern Mauritania, and extreme western Mali, delaying crop plantings.

Fortunately, July finally brought rains to the extreme western Sahel, where 10-65 mm were reported. Farther east, central sections of the Sahel from southern Mali eastward through southern Chad received abundant rainfall, as did the Ethiopian highlands, where up to 550 mm were measured. In contrast, very low amounts (5-60 mm) fell from west-central through northeastern Sudan.

Southwestern sections of Mauritania received near to above normal rains during August (70-110 mm) while the remainder of southern Mauritania, Senegal, and extreme southwestern Mali recorded subnormal totals (20-60 mm in northern Senegal;

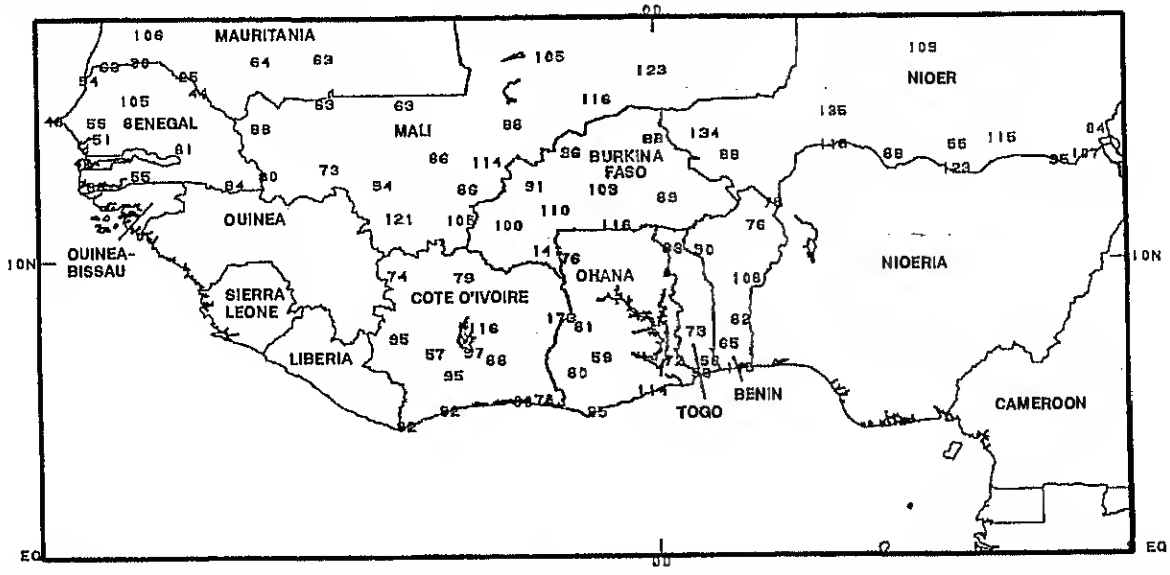
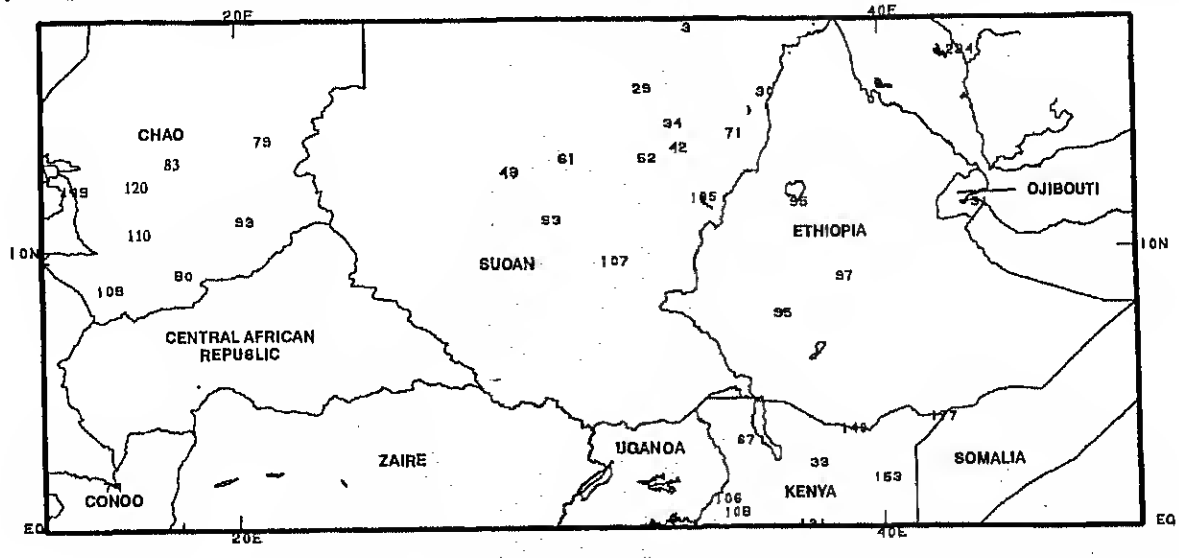


FIGURE 1. Percent of Normal Rainfall across the African Sahel, May 1 - September 21, 1991. *Near to above normal precipitation fell through much of the western Sahel (top) while most locations farther east were unusually dry (bottom). Portions of Sudan and Ethiopia from 11°N to 13°N measured under half of normal rainfall, as did parts of Senegal, where most of the last twenty years have brought abnormally dry rainy seasons. It should be noted, however, that actual totals for September 1 - 21 across Mali, Chad, and Sudan are probably greater than reported.*



75–200 mm elsewhere, representing 30%–75% of the monthly normal at most locations). In addition, August was somewhat dry through southeastern Chad, where 220–235 mm of rain fell, and across central and northeastern Sudan, where most areas received only 25%–60% of normal. In sharp contrast, portions of extreme southern Burkina Faso and southwestern Niger received excessive amounts of rain. Up to 585 mm drenched southern Burkina Faso and probably portions of northeastern Ghana, although reliable data are lacking in the latter area. Flooding was reported in portions of Ghana as well as in isolated sections across Sudan.

During September, rainfall is typically on the decline across the Sahel, decreasing in coverage and intensity as the month progresses. This has also been the case during 1991 at most locations, with the exception of extreme western sections. Exceptionally wet weather has been observed during September 1991, helping alleviate the anomalously late start and low amounts that the current season brought to Senegal, southern Mauritania, and extreme southwestern Mali. Over 200 mm has drenched portions of central Senegal during September. By the third week of the month, however, totals had significantly dropped throughout the Sahel; during September 15–21, 1991, only portions of central Senegal and extreme southern Niger measured over 50 mm of rain.

As a whole, the 1991 African Sahel rainy season through September 21 was rather uneventful. A very poor start to the season in the western Sahel has been followed by unusually heavy late-season rains, and it is not yet apparent to what extent the late wetness compensated for the earlier dryness. There is also some indication, despite a lack of reliable data, the Eritrea, northern Tigre, and Djibouti experienced a somewhat drier than normal rainy season. In contrast to the rest of the Sahel, the aforementioned areas have an additional seasonal precipitation maximum during February–April, which was exceptionally dry during 1991. Elsewhere, near to somewhat above normal totals were measured as the 1991 rainy season, barring any exceptional late-season events, appears to be very close to the average of the previous twelve seasons (see Figures 1 and 2).

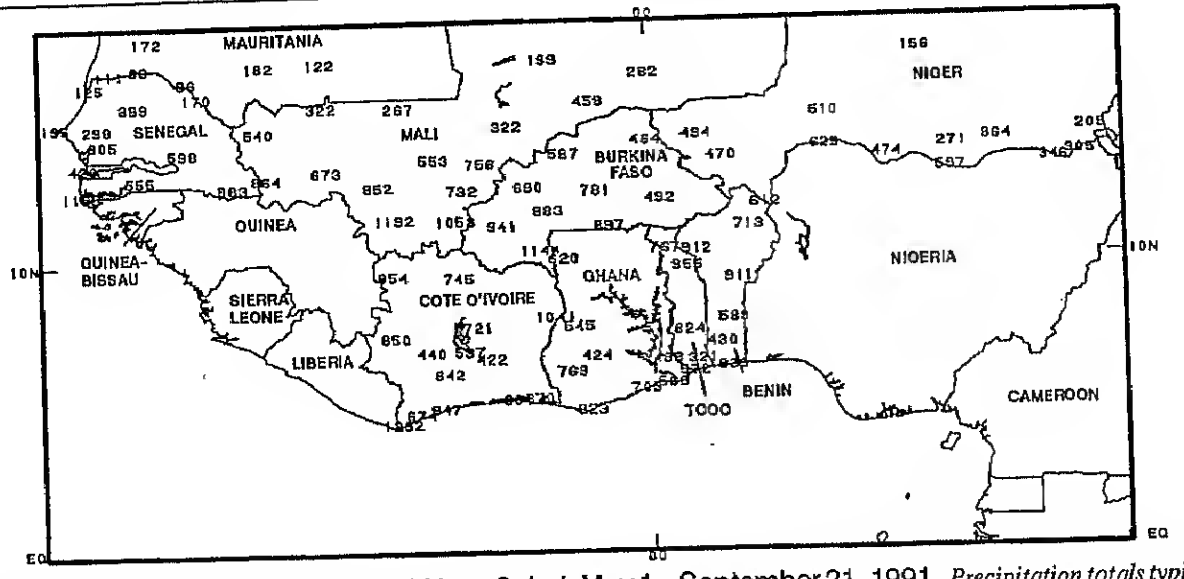


FIGURE 2. Total Rainfall across the African Sahel, May 1 – September 21, 1991. *Precipitation totals typically decrease from south to north ocross the Sohel, except for lorge totals through the Ethiopion highlands, and the 1991 roiny season wos no exception. Over 1000 mm of roin drenched ports of extreme southeostern Senegal, southern Moli, southwestern Burkino Faso, eastern Cote D'ivoire, southern Chad, ond the Ethiopian highlands. In contrast, fewer than 200 mm dampened northeastern Sudan, western ond northern Senegal, ond the northern fringes of the Sahel.*